UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/757,671	01/10/2001	Charles Chuang	8688.211US01	7455

7590 11/18/2004

Marchant & Gould P.C.
P.O. Box 2903
Minneapolis, MN 55402-0903

EXAMINER	
TRAN, NHAN T	

ART UNIT	PAPER NUMBER
2615	3

DATE MAILED: 11/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/757,671	CHUANG ET AL.	
	Examiner	Art Unit	
	Nhan T. Tran	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 January 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,7,10,12-15,17-22,25-28,31-33,35-38 and 40-45* is/are rejected.

7)☒ Claim(s) *5,8,9,11,16,23,24,29,30,34,39 and 46* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 January 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Taiwan on 01/10/2000. It is noted, however, that applicant has not filed a certified copy of the 089100199 application as required by 35 U.S.C. 119(b).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 12-13, 18-19, 31, 36, 41-42 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsukui (US 5,589,880).

Regarding claim 12, Tsukui discloses an imaging apparatus (Fig. 10) for generating an enhanced optical image of a scene, comprising:

an image generating device (Fig. 10) for generating at least first and second optical image data corresponding to an optical image input of the scene taken at a single exposure (Figs. 10 & 11), the optical image input having a wide input dynamic range with at least higher and lower

dynamic range portions (output from image sensors 4 & 3, respectively), the higher dynamic range portion having an upper range limit (at I4) that serves as an upper range limit of the wide input dynamic range, the lower dynamic range portion having a lower range limit (at I3) that is lower than the upper range limit of the higher dynamic range portion (see Fig. 11) and that serves as a lower range limit of the wide input dynamic range, the first optical image data having a dynamic range corresponding to the higher dynamic range portion, the second optical image data having a dynamic range corresponding to the lower dynamic range portion (see col. 8, line 63 – col. 9, line 35 and *note that both sensors 4 & 3 capture "a single exposure" with different sensitivities*);

an image combining device (adder 50, Fig. 10), coupled to the image generating device, for combining the first and second optical image data to result in optical image output data corresponding to the enhanced optical image of the scene (see col. 15, line 34 – col. 16, line 67).

Regarding claim 13, Tsukui also discloses that the image generating device comprises:

an optical imaging lens (1) for providing the optical image input (col. 10, lines 31-32);

an image sensing unit (3, 4), coupled to the optical imaging lens, for generating input optical image signals corresponding to the optical image input;

at least first and second video amplifiers (5a & 5b) coupled to the image sensing unit and configured to process the input optical image signals so as to generate respectively first and second optical image signals, wherein the first optical image signals have a dynamic range corresponding to the higher dynamic range portion, and the second optical image signals have a dynamic range corresponding to the lower dynamic range portion (see Fig. 11);

and at least first and second analog-to-digital converters (7a & 7b) coupled respectively to the first and second video amplifiers, the first and second analog-to-digital converters converting the first and second optical image signals so as to obtain the first and second optical image data respectively therefrom (see Fig. 10; col. 10, lines 31-36).

Regarding claim 18, Tsukui further discloses that the image generating device further includes first and second image buffer units (8a & 8b), coupled to the image combining device (adder 50) and to a respective one of the first and second analog-to-digital converters (7a & 7b), for storing the first and second optical image data therein, respectively. See Fig. 10.

Regarding claim 19, Memories 8a & 8b are clearly line buffers (col. 10, line 36).

Regarding claim 31, see the analysis of claim 12.

Regarding claim 36, see the analyses of claims 12 & 13.

Regarding claims 41 & 42, see the analyses of claims 18 & 19, respectively.

Regarding claim 1, see the analysis of claim 12.

Regarding claim 2, see the analysis of claim 13.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 3-4, 14-15, 17, 32-33, 37-38, 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukui (US 5,589,880) in view of Hannah (US 5,712,682).

Regarding claim 14, Tsukui teaches signals of higher and lower dynamic range portions output from AD converters 8a and 8b are detected to be used for controlling iris and integration time as shown in Fig. 10; col. 13, lines 17-27. However, Tsukui does not teach that a control device coupled to the first and second amplifiers for adjusting bias and gain settings of the first and second video amplifiers in accordance with such range limits.

As taught by Hannah, different luminance levels (dynamic range) of incident light output from pixels are detected from the output of an AD converter to control gain of an amplifier (106) so that the dynamic range of the image is further enhanced (Figs. 7A-7D, 8 & 9; col. 2, lines 34-41).

Therefore, it would have been obvious to one of ordinary skill in the art to enhance the camera in Tsukui by providing a control device for adjusting gain of the first and second video amplifier in accordance with the range limits of the higher and lower dynamic range portions of the wide input dynamic range so that optimum dynamic range of output image is obtained.

Although the combined teachings of Tsukui and Hannah does not provide a description for "bias settings", an Official Notice is taken that it is well known in the art that both gain and bias settings of an amplifier are adjusted to reduce amplification noise.

Therefore, it would have been obvious to one of ordinary skill in the art to adjust both gain and bias settings in the combined Tsukui and Hannah to reduce amplification noises on the first and second image signals.

Regarding claim 15, Tsukui in view of Hannah would also include the control device that is further coupled to one of the first and second analog-to-digital converters, and determines the higher and lower dynamic range portions of the wide input dynamic range so as to determine the bias and gain settings of the first and second video amplifiers by analyzing light level coordinate distribution of image pixel data that constitute one of the first and second optical image data from said one of the first and second analog-to-digital converters. See Hannah, Figs. 7A-7C, 8 & 9.

Regarding claim 17, Tsukui in view of Hannah would also comprise a control device including an image processor (combined processing circuits) coupled to the first and second video amplifiers and to said one of the first and second analog-to-digital converters;

a data storage unit (8a, 8b), coupled to the image processor, for storing range information of the higher and lower dynamic range portions of the wide input dynamic range therein; and

a timing controller (18, 19), coupled to the image processor and the image sensing unit, for controlling integration times of the image sensing unit. See Fig. 10 and col. 13, lines 17-27 in Tsukui and Figs. 8 & 9 in Hannah.

Regarding claims 32 & 33, see the analyses of claims 14 & 15, respectively.

Regarding claims 37 & 38, see the analyses of claims 14 & 15, respectively.

Regarding claim 40, see the analysis of claim 17.

Regarding claims 3 & 4, see the analyses of claims 14 & 15, respectively.

4. Claims 6, 20, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukui (US 5,589,880) in view of Shimizu et al (US 5,559,555).

Regarding claim 20, it is clear in Tsukui that the image sensing unit includes first and second image sensors (4, 3) coupled respectively to the first and second video amplifiers (5a, 5b), the imaging apparatus further comprising a control device (an inherent control device for the camera to function as disclosed) coupled to the first and second image sensors (Fig. 10). However, Tsukui does not teach that the control device is coupled to the first and second image sensors and also coupled to the first and second video amplifiers for adjusting integration times of the first and second image sensors, and bias settings of the first and second video amplifiers in

accordance with the range limits of the higher and lower dynamic range portions of the wide input dynamic range. Instead, Tsukui teaches that integration time of the image sensor 4 is controlled based upon the dynamic range limits output from both image sensors 4 & 3.

Shimizu teaches a control circuit (Fig. 2) for detecting variation of luminance levels (dynamic range) of pixel signals output from AD converter (5) and adjusting not only iris (2), integration time of the image sensor (13) *but also varying gain of amplifier* (4) based upon the detected all luminance levels including lower and upper levels (Fig. 9; col. 9, lines 38-54), wherein the gain of the amplifier is adjusted to maximum gain in accordance with lower luminance levels, and adjusted to minimum gain in accordance with upper luminance levels so as to optimize exposure control in correspondence to luminance levels of an object (col. 2, lines 45-48).

Therefore, it would have been obvious to one of ordinary skill in the art to improve the camera in Tsukui by modifying the control circuit to include the teaching of Shimizu for adjusting the first and second integration times of the first and second image sensors and gain settings of the first and second video amplifiers in accordance with the range limits of the higher and lower dynamic range portions of the wide dynamic range so that optimum exposure control is obtained.

Although the combined teachings of Tsukui and Shimizu does not specifically provide a description for "bias settings", an Official Notice is taken that it is well known in the art that both gain and bias settings of an amplifier are adjusted to reduce amplification noise.

Therefore, it would have been obvious to one of ordinary skill in the art to adjust both gain and bias settings in the combined Tsukui and Shimizu to reduce amplification noises on the first and second image signals.

Regarding claim 21, it is clearly shown in Tsukui an image splitter (prism 2) disposed between the optical imaging lens (1) and the first and second image sensors for splitting the optical image input and for providing splitting optical inputs to the first and second image sensors, respectively (see Tsukui, Fig. 10, col. 8, lines 44-48; col. 10, lines 29-33 and col. 11, lines 12-18).

Regarding claim 6, see the analysis of claim 20.

5. Claims 7, 22, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukui in view of Shimizu et al as applied to claim 20 and in further view of Hannah (US 5,712,682).

Regarding claim 22, the combination of Tsukui and Shimizu teaches all limitations of claim 22 (see claim 20, and note AD converters are coupled to the control circuit) except for "analyzing *light level coordinate distribution of image pixel data* that constitute one of the first and second optical image data from the one of the first and second AD converters. However, as taught by Hannah, light level coordinate distribution of image pixel data (or histogram) output from an AD converter is analyzed to enable gain control of a camera. See Hannah, Figs. 7A-7D, 8 & 9.

Therefore, it would have been obvious to one of ordinary skill in the art to provide an alternative configuration to the control circuit in Tsukui and Shimizu for determining variation of dynamic range portions by using histogram analysis to adjust the integration times and bias settings so as to obtain an accuracy in exposure and gain control of the camera.

Regarding claim 28, see the analyses in claims 6 & 17.

Regarding claim 7, see the analysis of claim 22.

6. Claims 10, 25-27, 35, 43-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukui (US 5,589,880) in view of Ginosar et al (US 5,144,442).

Regarding claim 25, Tsukui does not specifically disclose that the image generating device includes neighborhood transform means for applying neighborhood transform processing to the first and second optical image data prior to reception by the image combining device.

Ginosar teaches neighborhood transform processors (i.e., NTP 72 in Fig. 3 or NTP 20 in Fig. 1) used to reduce low frequency portions of video data and to perform edge enhancement transform on video data prior to reception by image combining device (24 or 74). See col. 4, lines 41-65 and col. 6, lines 41-45.

Therefore, it would have been obvious to one of ordinary skill in the art to provide in Tsukui neighborhood transform means for applying neighborhood transform processing to the first and second optical image data to reduce low frequency portions of video data and to

perform edge enhancement transform on video data prior to reception by the image combining device.

Regarding claims 26 & 27, see the analyses of claims 18 & 19, respectively.

Regarding claims 35 & 43, see the analysis of claim 25.

Regarding claims 44 & 45, see the analyses of claims 18, 19 and 25.

Regarding claim 10, see the analysis of claim 25.

Allowable Subject Matter

7. Claims 5, 8-9, 11, 16, 23-24, 29-30, 34, 39, 46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 16, the prior art of record fails to teach or fairly suggest the combination of all limitations required in claim 16, including "the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number, and the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of

the image pixel data that is above the predetermined light level threshold number; *the control device adjusting a lower range limit of the higher dynamic range portion and an upper range limit of the lower dynamic range portion until a total number of the image pixel data having light levels that fall in either one of the higher and lower dynamic range portions is greater than a predetermined pixel threshold number.*"

Regarding claim 23, the prior art of record fails to teach or fairly suggest the combination of all limitations required in claim 23, including "*the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number, and the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number; the control device further determining a lower range limit of the higher dynamic range portion and an upper range limit of the lower dynamic range portion by finding a non-significant dynamic range portion of the wide input dynamic range of the optical image input, the non-significant dynamic range portion encompassing a greatest number of consecutive light level coordinates distributed with a number of the image pixel data that is below the predetermined light level threshold number, the lower range limit of the higher dynamic range portion being an upper range limit of the non-significant dynamic range portion, the upper range limit of the lower dynamic range portion being a lower range limit of the non-significant dynamic range portion.*"

Regarding claim 24, the claim is objected as being dependent of claim 23.

Regarding claim 29, the prior art of record fails to teach or fairly suggest the limitations required in claim 29: "the control device is further coupled to the image combining device so as to provide range information of the higher and lower dynamic range portions of the wide input dynamic range thereto, the optical image output data *including attribute information to permit reconstruction of the first and second optical image data therefrom.*"

Regarding claim 30, the prior art of record fails to teach or fairly suggest the combination of all limitations required in claim 30, including "the upper range limit of the higher portion is the largest light level dynamic range coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number, and the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number; *the control device determining a lower range limit of the higher dynamic range portion by inspecting successive ones of the light level coordinates in a descending order starting from the upper range limit of the higher dynamic range portion until a light level coordinate distributed with a number of the image pixel data that is below the predetermined light level threshold number is detected; the control device further determining an upper range limit of the lower dynamic range portion by inspecting successive ones of the light level coordinates in an ascending order starting from the lower range limit of the lower dynamic range portion until a light level coordinate distributed with a number of the image pixel data that is below the predetermined light level threshold number is detected.*"

Regarding claim 39, the prior art of record also fails to teach or suggest the limitations of claim 34, including "*the control device determines the number and the range limits of the dynamic range portions such that a total number of the image pixel data having light levels that fall in any one of the dynamic range portions is greater than a predetermined pixel threshold number.*"

Regarding claim 5, the method claim 5 is objected for the same reason provided for claim 16.

Regarding claim 8, the method claim 8 is objected for the same reason provided for claim 23.

Regarding claim 9, the claim is objected as being dependent of claim 8.

Regarding claim 11, the method claim 11 is objected for the same reason provided for claim 30.

Regarding claim 34, the method claim 34 is objected for the same reason provided for claim 39.

Regarding claim 46, the method claim 46 is objected for the same reason provided for claim 29.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nhan T. Tran whose telephone number is (703) 605-4246. The examiner can normally be reached on Monday - Thursday, 8:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew B Christensen can be reached on (703) 308-9644. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NT.

ANDREW CHRISTENSEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600